Space Weather Forecast

Issued on Saturday, 18 March 2023 at 13:29 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Chance of G1 Minor Storm intervals with Coronal Mass Ejection glance possible day 3 or 4 (20th or 21st) but low confidence. Chance of Moderate flares.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: One Moderate flare was observed, likely a combined effect from a brief flare from a small sunspot in the southwest during a longer lasting but only common class flare from the larger sunspot in the southeast. Of the three visible sunspot regions this latter one is the largest, with some complexity becoming apparent as it rotates into a clearer view. A further unnumbered sunspot to the southeast of this region is also moving into view. The other two numbered regions are much smaller and simpler, with one decaying.

The main activity of interest has been a couple of "filament eruptions". This is where lines of plasma, held above the Suns surface are released due to changes in the magnetic structure. These can be a source of coronal mass ejections (CMEs), along with some flare activity without nearby sunspots. The most notable of these was a long filament, which left the southwest disc just before this period, at 17/1100 UTC but with the CME subsequently observed during it. Available imagery for analysis is currently limited, resulting in a broader range of possible solutions than would ordinarily be the case. After some reassessment, this is now considered likely give a glancing impact late on day 3 or early day 4 (20th or 21st), although most of the material is still expected to miss to the south and ahead of Earth. Smaller filaments were also observed lifting from the northwest disc at 17/1800 UTC and 17/2100 UTC. Any CME from this location would have the potential to be Earth-directed, however none has currently been observed. Confidence is low with the geomagnetic forecast due to these eruptions.

Solar Wind / Geomagnetic Activity: The solar wind speed was slightly elevated at around 400-460 km/s throughout. The interplanetary magnetic field strength was weak, with the north-south directed component variable and also weak. Resultant geomagnetic activity was Quiet (Kp 0-2).

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is very near background levels, having continued its decline since the S1/Minor Solar Radiation Storm that occurred earlier this week.

Four-Day Space Weather Forecast Summary

Solar Activity: Low activity is most likely, but with a chance of increasing to Moderate at times with isolated M-flares throughout. These most likely from the larger sunspot in the southeast, or from other regions that are rotating onto the southeast disc, and also onto the northeast disc later in the period.

Solar Wind / Geomagnetic Activity: A glancing CME impact is possible day 3 or early day 4 (20th or 21st), however this is low confidence. This will come alongside a muted connection to the fast winds from a small coronal hole. Geomagnetic activity is expected to be mainly Quiet until this faster wind arrival, then becoming Unsettled with Active intervals likely (Kp 3-4). Any CME arrival will likely increase this further, to Active to G1 Minor Storm intervals (Kp 4-5).

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Activity then likely easing later day 4 (21st).

Energetic Particles / Solar Radiation: The count rate of energetic particles is expected to continue very gradually declining to background, with no other significant enhancements currently anticipated. Solar Radiation storms are currently not expected.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	1	30	20
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	30	30	30	30
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	1	1	1	1
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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